

# Project 5

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## 1. Introduction

The project is about Grover's algorithm in quantum computing.

Based on [wikipedia](#), "Grover's algorithm is a quantum algorithm that finds with high probability the unique input to a black box function that produces a particular output value, using just  $O(\sqrt{N})$  evaluations of the function, where  $N$  is the size of the function's domain. It was devised by Lov Grover in 1996."

Use IBM Quantum Experience to realize the algorithm.

## 2. Environment

- [IBM Quantum Experience](#)

### 3. Implementation

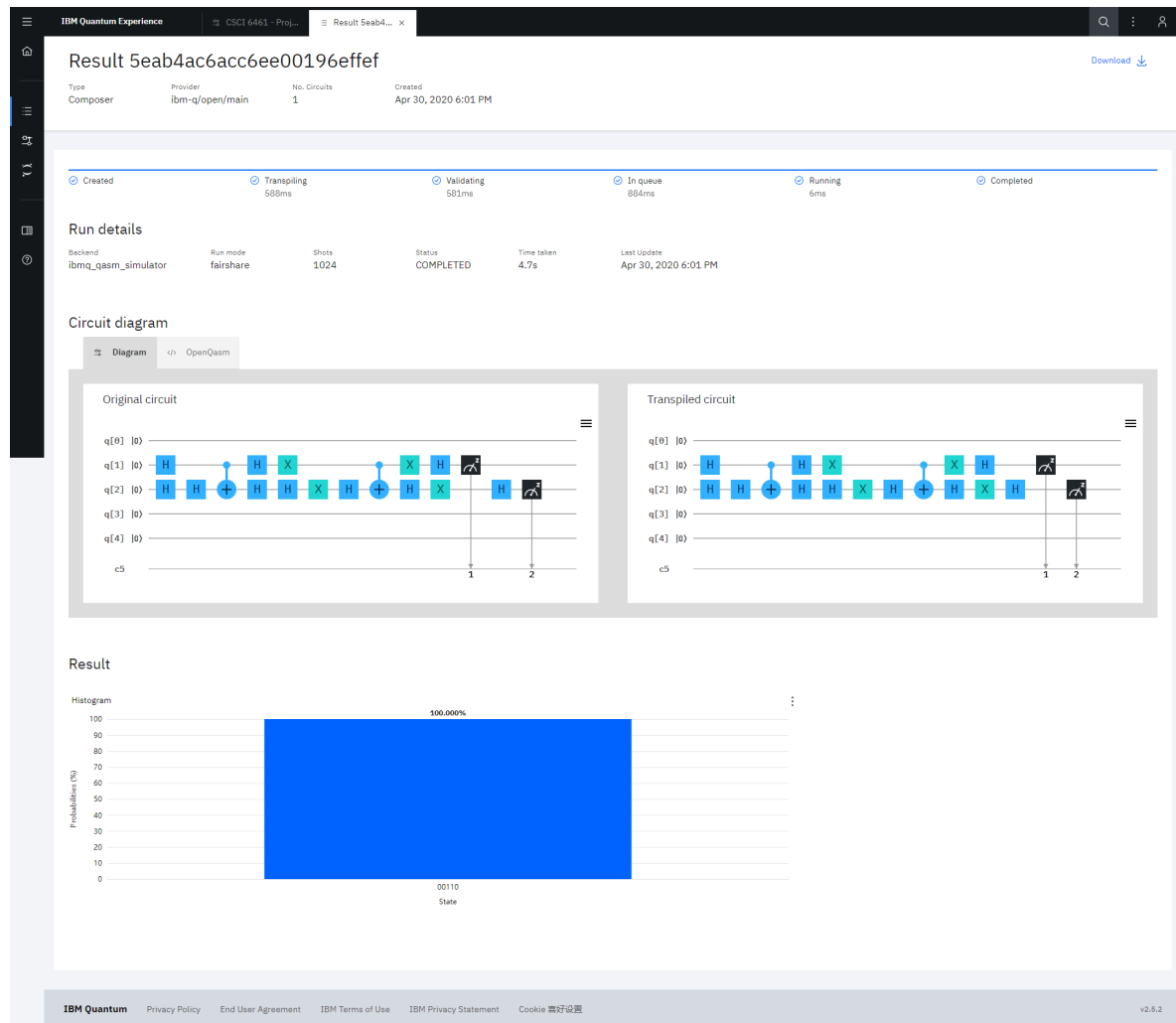
[https://www.youtube.com/watch?v=pYD6bvKLI\\_c](https://www.youtube.com/watch?v=pYD6bvKLI_c)

The image displays two screenshots of the IBM Quantum Experience web application.

The top screenshot shows the user's dashboard for Zhicheng Zhang. It includes sections for "Recent circuits (0)", "Your providers", "Pending results (0)", and "Latest results (0)". On the right, there is a list of "Your backends (10)" with details for each quantum system, including the number of qubits and the current queue status.

The bottom screenshot shows the "Circuit composer" interface. It features a "Composer help" sidebar, a "Gates" palette, and a central workspace for building quantum circuits. The circuit is visualized on a grid with qubits q[0] through q[4] and a classical register c[5]. The bottom of the interface includes a "Pending results (0)" section and a footer with IBM Quantum links and version information (v2.5.2).

## 4. Result



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{
  "type": "QASM",
  "experiments": [
    {
      "config": {
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        "n_qubits": 5
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      "header": {
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        "c1bit_labels": [
          [ "c", 0 ],
          [ "c", 1 ],
          [ "c", 2 ],
          [ "c", 3 ]
        ],
        "qreg_sizes": [
          [ "q", 5 ]
        ],
        "qubit_labels": [
          [ "q", 0 ],
          [ "q", 1 ],
          [ "q", 2 ],
          [ "q", 3 ],
          [ "q", 4 ]
        ]
      }
    }
  ]
}
```

```

    ]
  ],
  "n_qubits": 5,
  "creg_sizes": [
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  ],
  "name": "circuit376"
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  {
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    "name": "h"
  },
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    "name": "h"
  },
  {
    "qubits": [ 1, 2 ],
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  {
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    "name": "x"
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  {
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  },
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    "qubits": [ 1, 2 ],
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  },
  {
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    "name": "x"
  },
  {

```

```

        "qubits": [ 1 ],
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    },
    {
        "qubits": [ 2 ],
        "name": "h"
    },
    {
        "qubits": [ 2 ],
        "name": "x"
    },
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        "qubits": [ 2 ],
        "name": "h"
    },
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        "name": "measure",
        "memory": [ 1 ]
    },
    {
        "qubits": [ 2 ],
        "name": "measure",
        "memory": [ 2 ]
    }
]
}
],
"qobj_id": "dd8ff687-eb09-4e97-8e30-6ebf4fd61c8f",
"config": {
    "memory_slots": 5,
    "memory": false,
    "n_qubits": 5,
    "parameter_binds": [],
    "shots": 1024
},
"schema_version": "1.1.0",
"header": {}
}

```

## 5. Conclusion

It is a simple project about quantum computing. I have learnt some basic concepts and useful tools.